

Indiana Bat

Myotis sodalis

Guidelines for Landowners Using Conservation Practices

Missouri Department of
Conservation

Common name ▪ Indiana Bat
Scientific name ▪ *Myotis sodalis*
State status ▪ Endangered
Federal status ▪ Endangered

Ecology

Indiana bats use two types of habitat depending on the season. Summer habitat consists of wooded or semi-wooded areas, often, but not necessarily, along streams. Females form maternity colonies in which they each bear offspring under loose bark of dead trees, hollow trees and occasionally live trees. Large, dead trees at edges, in the open, or in canopy gaps in the forest are selected as primary roosts. Maternity colonies also use live shagbark hickory (*Carya ovata*) and large white oaks (*Quercus alba*) as secondary roosts because of their loose bark. Roost trees have a diameter at breast height of at least 9 inches; trees greater than 21 inches are preferred as primary roosts. Indiana bats forage on insects in and around the tree canopy of flood plain, riparian, and upland forest between 10 to 33 feet above ground. Streams, flood plain forests, and impounded bodies of water such as ponds, reservoirs and wetlands are also used as foraging habitats for pregnant and lactating bats.

Mating occurs from late August to early October, prior to hibernation, or in the spring. Females arrive at caves and begin hibernation in October, while males remain active in order to mate with arriving females. Males roost in trees near hibernation sites (usually within five miles) during the swarming and mating period. Young are born during June and early July. Litter size is one and young first fly at 25 to 37 days. Maximum longevity of the Indiana bat is about 15 years.



Photo Credit: Dr. J. Scott Altenbach

During the winter, Indiana bats hibernate in cold trap caves or mines referred to as hibernacula. Hibernating Indiana bats characteristically form large, compact clusters. Clustering may perform certain beneficial functions, such as protecting the central individuals from temperature changes, reducing the sensitivity of most bats to external disturbance, or rapid arousal and escape from predators. Bats have the ability to lower their metabolism during hibernation, thereby reducing the amount of energy they use. They enter hibernation with enough fat reserves to last until spring. Repeated disturbance to bats while they are hibernating can arouse them and may result in starvation if critical fat reserves are depleted before insects are again available in the spring.

Reasons for Decline

Indiana bat populations were first surveyed in the late 1950s. Since then, many hibernacula populations in the southern part of the range have decreased, including in Missouri. A serious cause of the decline has been human disturbance while bats are hibernating. Even well-meaning recreation cavers and researchers may arouse the bats. Direct mortality due to human vandalism has also been documented. Some hibernacula are unsuitable or unavailable to bats because humans built improper gates in cave entrances, preventing entry by bats or altering air flow. Other human-related factors that have been implicated in the decline of the species include cave commercialization, habitat changes

such as stream channelization and bank modification, forest clearing and agricultural development, and indiscriminate collecting. Natural hazards such as river flooding and below freezing temperatures also have decreased Indiana bat populations in certain vulnerable hibernacula.

Recommendations

It is important to manage forested areas along streams as well as upland woodlands and forests for maternity roosts during the summer using the chart below. In addition, protection of hibernating caves and karst is essential to provide for winter roosting sites.

Forest Type	Number of Snags per Acre		
	<19"	10'-19"	<10'
Open/Semi-Open or Bottomland Hardwood	1	4	2
Riparian Corridor	1	7	4
Heavily Forested (South Missouri)	0.5	4	2

Contain all construction debris to prevent its accidental introduction into caves, sinkholes, or springs as a result of clean-up activities, run-off, flooding, wind, or other natural forces. Dispose of chemicals, toxic wastes, garbage, and wash water from trucks in areas designated for such wastes. These sites should be away from caves and sinkholes. Protect natural hydrology to avoid lowering of the water table. If temporary roadways must be built, ensure that roadways are of low gradient with sufficient roadbed and storm water runoff drains and outlets. Minimize sedimentation and chemical or nutrient-laden runoff into streams, sinkholes, caves, and abandoned wells by implementing and monitoring erosion and sediment controls for the duration of the project.

Re-establish and maintain forested riparian corridors at least 100-feet wide along streams and springs and around cave and sinkhole entrances to reduce erosion and capture nutrient rich runoff. Minimize erosion by revegetating disturbed areas as soon as possible.

Avoid camping or starting fires at a cave entrance. Smoke damages caves and drives out bats. Indiana

bats can be scared away by people camping at a cave's mouth.

To avoid any risk of harming or harassing Indiana bats, habitat suitable trees (trees larger than 9 inch dbh) north of the Missouri River may be removed between October 1 and March 31. A 5-mile radius around each hibernaculum shall also be maintained. This requires a no tree removal zone within a 1-mile radius and managed (restricted tree removal based on TSI/Harvest plan with bat consideration) Indiana bat habitat within a 4-mile radius beyond the 1-mile no tree removal zone.

Refer to Management Recommendations for Construction Projects Affecting Missouri Karst Habitat and Management Recommendations for Construction Projects Affecting Missouri Streams and Rivers.

Consider the balance between adverse and beneficial practices when determining the overall effect of a conservation practice.

Beneficial Practices

- Retain a continuous supply of snags of different diameter classes in woodlands and forested areas through time to provide maternal roost trees. Snag retention guidelines developed by Missouri Department of Conservation are listed in chart above
- Where possible, retain shagbark hickories as a component of the woodland or forest for use by bats.
- If a maternity roost tree is found, establish a 100-foot buffer around the tree to minimize disturbances and prevent abandonment of the roost trees.
- Protection and restoration of riparian corridors along streams.
- Nutrient and pest management on agricultural fields that results in reduced opportunities for runoff.
- Practices that control erosion and prevent the delivery of sediment to aquatic systems will prove beneficial to this species.
- Limit livestock access to streams.

- Livestock exclusion from sinkholes, springs, and karst areas.
- Filter strips and riparian corridors around sinkholes and springs.

Adverse Practices

- Unmanaged application of pesticides, animal waste or fertilizers that destroy or degrade habitats that support populations of this species.
- Disposal of chemicals, toxic waste, garbage, and wash water from trucks in areas not designated for such waste. Designated sites should be away from caves and sinkholes.
- Removing habitat suitable roost trees between April 1 and September 30 for any county north of the Missouri.
- Unmanaged tree removal within a 5-mile radius and any tree removal within a 1-mile radius of known hibernacula sites.
- Removing or degrading the riparian corridor near springs and along streams.
- Uncontrolled livestock access to forested riparian corridors and streams.
- Access to hibernacula from September 1 through April 30.
- Installing a drain into a karst feature without a filter strip surrounding the point of entry.
- Building roadways, paths etc., to cave entrances which could result in increased human activity at the cave entrance and potential impacts to cave ecosystems.
- Poor smoke management when conducting a prescribed burn in areas with caves.
- Stream channelization.

Information Contacts

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<http://www.mdc.mo.gov/nathis/endangered/>

Missouri Department of Natural Resources
Division of Environmental Quality
P.O. Box 176
Jefferson City, MO 65102-0176
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<http://www.dnr.mo.gov/env/index.html>

U.S. Army Corps of Engineers
Regulatory Branch
700 Federal Building
601 E. 12th Street
Kansas City, MO 64106-2896
Telephone: 816-389-3990
<http://www.nwk.usace.army.mil/>

U.S. Environmental Protection Agency
Water, Wetlands, and Pesticides Division
901 North 5th Street
Kansas City, KS 66101
Telephone: 913-551-7003 / 800-223-0425
<http://www.epa.gov/region7/>

U.S. Fish and Wildlife Service
Ecological Services Field Office
101 Park DeVillie Dr., Suite A
Columbia, MO 65203
Telephone: 573-234-2132
<http://www.fws.gov/midwest/partners/missouri.html>

Legal

The Missouri Department of Conservation prepared these guidelines for conservation practices with assistance from other state agencies, contractors, and others to provide guidance to those people who wish to voluntarily act to protect wildlife and habitat.

Compliance with these management guidelines is not required by the Missouri wildlife and forestry law or by any regulation of the Missouri Conservation Commission. Other federal, state or local laws may affect construction practices.

“State Endangered Status” is determined by the Missouri Conservation Commission under constitutional authority, and specific requirements for impacts to such species are expressed in the Missouri Wildlife Code, rule 3 CSR 10-4.111.

Species listed under the Federal Endangered Species Act must be considered in projects receiving federal funds or requiring permits under the Clean Water Act, with compliance issues resolved in consultation with the U.S. Fish and Wildlife Service.